



### Nikon Camera

The camera pictured, a Nikon FM compact, has a simplification feature derived from cameras designed for easy yet accurate use by Skylab astronauts working in a weightless environment. The innovation is a plastic-cushioned advance lever which advances the film and simultaneously switches on a built-in light meter; with a turn of the lens aperture ring, a glowing signal in the viewfinder confirms correct exposure. The Skylab cameras were developed under NASA contract by Nikon, Inc., Garden City, New York, which later incorporated the advance lever feature in its own product.



### Loudspeaker Performance Aid

Hi-fi loudspeakers are electro-acoustical systems which convert electrical current variations into sound. In the process, they generate a lot of heat. In most speakers, the heat is increased significantly when the discotheque operator or home listener turns the volume knob to maximum output. The system's ability to function properly depends to considerable degree on dissipating the heat; an effective method of cooling enhances overall sound reproduction and reduces the incidence of loudspeaker failure.

Many manufacturers of loudspeakers, such as those pictured, are now using a magnetic liquid cooling agent known as ferrofluid, development of which originated in space research. Produced by Ferrofluidics Corporation, Nashua, New Hampshire, ferrofluid is a liquid material in which sub-microscopic particles of iron oxide are permanently suspended. Injected into the voice coil segment of the speaker system, the magnetic liquid serves as a superior heat transfer medium for cooling the voice coil, thus substantially increasing the system's ability to handle higher power levels and decreasing the chance of speaker failure. Ferrofluid offers several additional advantages which add up to improved speaker performance, lower manufacturing costs and fewer rejects.

NASA's ferrofluid research involved work at Lewis Research Center on a magnetic liquid for control of spacecraft liquid propellants under the zero gravity conditions of space. At Avco Research Center, Dr. Ronald Moskowitz and Dr. Ronald Rosensweig were working on an unrelated application of magnetic fluid. They obtained a license for the NASA technology, which served as a departure point for their further development of ferrofluid. They founded Ferrofluidics Corporation, which has significantly advanced the basic technology and developed a line of rotary shaft seals used in such applications as integrated circuit production, computer discs, medical equipment, visual displays, analytical instrumentation, automated machine tools and industrial processes.